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# MOLECULAR BIOLOGY OF THE CELL

## THIRD EDITION

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**Front cover:** The photograph shows a rat nerve cell in culture. It is labeled (yellow) with a fluorescent antibody that stains its cell body and dendritic processes. Nerve terminals (green) from other neurons (not visible), which have made synapses on the cell, are labeled with a different antibody. (Courtesy of Olaf Mundigl and Pietro de Camilli).

**Dedication page:** Gavin Borden, late president of Garland Publishing, weathered in during his mid-1980s climb near Mount McKinley with MBoC author Bruce Alberts and famous mountaineer guide Mugs Stump (1940–1992).

**Back cover:** The authors, in alphabetical order, crossing Abbey Road in London on their way to lunch. Much of this third edition was written in a house just around the corner. (Photograph by Richard Olivier.)

**consensus sequence**

Average or most typical form of a sequence that is reproduced with minor variations in a group of related DNA, RNA, or protein sequences. The consensus sequence shows the nucleotide or amino acid most often found at each position. The preservation of a consensus implies that the sequence is functionally important.

**constitutive**

Produced in constant amount; opposite of regulated. Constitutive secretion, for example, occurs continuously without requiring an external stimulus.

**cooperativity**

Phenomenon in which the binding of one ligand molecule to a target molecule promotes the binding of successive ligand molecules. Seen in the assembly of large complexes, as well as in enzymes and receptors composed of multiple allosteric subunits, where it sharpens the response to a ligand. (See Figure 15-45.)

**cosmid**

Cloning vector used to carry large segments of DNA into and out of cells; derived from bacteriophage lambda.

**co-transport (coupled transport)**

Membrane transport process in which the transfer of one molecule depends on the simultaneous or sequential transfer of a second molecule.

**coupled reaction**

Linked pair of chemical reactions in which the free energy released by one of the reactions serves to drive the other.

**covalent bond**

Stable chemical link between two atoms produced by sharing one or more pairs of electrons.

**crista (plural cristae)**

(1) One of the folds of the inner mitochondrial membrane. (2) A sensory structure in the inner ear.

**critical concentration**

Concentration of an unassembled protein, such as actin or tubulin, that is in equilibrium with the assembled form of the protein. (See Panel 16-1, pp. 824-825.)

**crossing over**

Process whereby two homologous chromosomes break at corresponding sites and rejoin to produce two recombinant chromosomes. (See Figure 6-56.)

**cyclic AMP (cAMP)**

Nucleotide that is generated from ATP in response to hormonal stimulation of cell-surface receptors. cAMP acts as a signaling molecule by activating A-kinase; it is hydrolyzed to AMP by a phosphodiesterase.

**cyclin**

Protein that periodically rises and falls in concentration in step with the eucaryotic cell cycle. Cyclins activate crucial protein kinases (called cyclin-dependent protein kinases) and thereby help control progression from one stage of the cell cycle to the next.

**cyclin-dependent protein kinase (Cdk protein)**

Protein kinase that has to be complexed with a cyclin protein in order to act; different Cdk-cyclin complexes are thought to trigger different steps in the cell-division cycle by phosphorylating specific target proteins.

**cytochrome**

Colored, heme-containing protein that transfers electrons during cellular respiration and photosynthesis.

**cytokeratin**

Member of a family of intermediate filament proteins characteristic of epithelial cells.

**cytokine**

Extracellular signaling protein or peptide that acts as a local mediator in cell-cell communication.

**cytokinesis**

Division of the cytoplasm of a plant or animal cell into two, as distinct from the division of its nucleus (which is mitosis).

**cytokinin**

One of a family of small molecules that regulate the growth and development of plant cells.

**cytoplasm**

Contents of a cell that are contained within its plasma membrane but, in the case of eucaryotic cells, outside the nucleus.

**cytoskeleton**

System of protein filaments in the cytoplasm of a eucaryotic cell that gives the cell shape and the capacity for directed movement. Its most abundant components are actin filaments, microtubules, and intermediate filaments.

**cytosol**

Contents of the main compartment of the cytoplasm, excluding membrane-bounded organelles such as endoplasmic reticulum and mitochondria. Originally defined operationally as the cell fraction remaining after membranes, cytoskeletal components, and other organelles have been removed by low-speed centrifugation.

**cytotoxic T cell**

Type of T lymphocyte responsible for killing infected cells.

**dalton**

Unit of molecular mass. Approximately equal to the mass of a hydrogen atom ( $1.66 \times 10^{-24}$  g).

**degenerate**

Not a moral judgment but an adjective that describes multiple states that amount to the same thing: different triplet combinations of nucleotide bases (codons) that code for the same amino acid, for example.

**denaturation**

Dramatic change in conformation of a protein or nucleic acid caused by heating or by exposure to chemicals and usually resulting in the loss of biological function.

**dendrite**

Extension of a nerve cell, typically branched and relatively short, that receives stimuli from other nerve cells.

**deoxyribonucleic acid—see DNA****desmosome**

Specialized cell-cell junction, usually formed between two epithelial cells, characterized by dense plaques of protein into which intermediate filaments in the two adjoining cells insert.

**detergent**

Type of small amphipathic molecule that tends to coalesce in water, with its hydrophobic tails buried and its hydrophilic heads exposed; widely used to solubilize membrane proteins.